PHYTOTOXICOLOGY
SOIL SURVEY
IN THE VICINITY OF
ETCHED NAME PLATE,
2206 GERRARD ST., TORONTO
JULY 24, 1991

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Phytotoxicology Soil Survey in the Vicinity of Etched Name Plate, 2206 Gerrard St. E., Toronto - July 24, 1991.

Background

At the request of the MOE Central Region, Toronto East Office, the Phytotoxicology Section conducted a preliminary soil survey in the immediate vicinity of Etched Name Plate (ENP), 2206 Gerrard St. E., Toronto, on July 24, 1991. This metal plating facility had been operating at the same location for about 70 years. The local residents expressed concerns that their health problems may be related to emissions and/or soil contamination associated with this source. Soil contamination was identified as a specific issue because the back yards and a children's play area of the Main/Gerrard Community Development Housing Co-operative are directly adjacent to the north side of the ENP building. Also, other residential properties and municipal recreation/green areas are close to this source.

Survey Design

On July 24, 1991 Phytotoxicology investigator D. McLaughlin assisted by two seasonal technicians collected soil from 7 sites around ENP. There were no process stacks visible on the roof of the building. Therefore emissions would be released to the atmosphere through

building openings, such as windows, vents, and doors, and/or transferred to the local soil via pedestrian and vehicle traffic. The latter could re-entrain contaminated dust and particulate while travelling in and around the building. Soil contamination in the surrounding residential community, if present, would be close to the ENP building and occur only in the top few cm of the soil. This was a preliminary survey to determine if soil contamination was present. Therefore, the number of sample sites was limited, they were located in well-exposed, open areas, and they were close to the alleged source. If soil contamination was found as a result of this initial survey then a second, more extensive survey, would be subsequently conducted.

The sample sites, identified as numbers 1 through 7 in this report, were located as follows:

Site 1 - Coarse-textured soil-like material collected within 1 m of the north side of the ENP building.

Site 2 - Sandy soil collected from the lower section of the Co-operative's children's play area, between about 15 and 20 m north of the ENP building.

Site 3 - Lawn soil collected from the back yard of one of the Co-operative's residential units on the west side of the parking lot, about 50 m northwest of the ENP building.

Site 4 - Lawn soil collected from the southeast corner of the first residential property (north west corner of Gerrard St. and Enderby Rd.) west of ENP, about 75 m west of the source.

Site 5 - Lawn soil collected in front of the Ted Reeve Arena, about 100 m northeast of ENP.

Site 6 - Lawn soil collected from the front lawn of the Main Street Library, adjacent to the fence with the Beaches Alternate School, about 120 m southeast of ENP.

Site 7 - Lawn soil collected from the right field area of the northern-most ball diamond at the Ted Reeve Arena, about 200 m northeast of ENP.

The approximate location of the soil sample sites is illustrated in the attached map. Duplicate samples of surface soil (0-5 cm depth) were collected from these 7 sites using standard Phytotoxicology soil sampling protocols. The samples were processed (air-dried and sieved) at the Phytotoxicology processing laboratory, then forwarded to the MOE Inorganic Trace Contaminants laboratory for analysis of 17 inorganic elements.

Analyses for selected organic compounds (polyaromatic hydrocarbons - PAHs, and polychlorinated biphenyls - PCBs) also were conducted on soil collected from Sites 1, 4, 5, and 6. Separate, individual samples were collected from these four sites specifically for the organic analysis. Because of the potential for source-related contamination, the very low concentrations expected in "normal" urban soil, and the possibility of cross-contamination between sites under these conditions, the standard Phytotoxicology protocol for sampling soil for organic contaminants was strictly applied.

Analytical Results

Inorganic:

The results of the inorganic soil analyses are summarized in Table 1. The data are compared with the Phytotoxicology Upper Limit of Normal (ULN) guidelines for urban surface soil. The derivation and significance of the ULNs are explained in Appendix 1. ULNs are not available for Al, Na, and Sr, either because natural background concentrations are so variable or insufficient background data have been obtained. All data are ***parts per million*** (ppm). The ULNs were not exceeded for any element at any site. Furthermore, there was no concentration gradient (decreasing concentration in the soil with increasing distance from the source) detected for any of the elements, even though considerable effort was made to select sites that would most likely have accumulated atmospherically-deposited or locally re-entrained contamination from the vicinity of the ENP. With the exception of Sb at Site 1, all concentrations at all sample sites were well within the normal range for an urban environment. The mean soil Sb concentration at Site 1 was 3.72 ppm. Although this is less than half of the ULN (8 ppm), it is marginally higher than usually encountered in urban surface soil. By comparison, the next highest Sb concentration was 1.30 ppm, detected at both Sites 4 and 7 (the residential property to the west of ENP, and the ball diamond north of the Ted Reeve Arena, respectively). Site 1 was situated below the windows and within 1 m of the north side of the ENP building. The sample contained a considerable amount of non-soil-like coarse material that could have originated from process debris and accumulated over

time in the nearby soil. Even though the Sb concentration was highest at this site, the elevation was marginal, and is environmentally inconsequential.

Organic:

The results of the organic soil analyses are summarized in Table 2. The data in this table are in ***parts per billion*** (ppb), concentration units that are smaller by a factor of 1000 than those used for the inorganic soil data in Table 1. This enhanced analytical resolution is necessary because these organic compounds usually occur in very low concentrations in soil. There are no soil guidelines established for these compounds. However, a Canadian Federal/Provincial advisory committee (Canadian Council of Ministers of the Environment - CCME) has ***proposed*** interim soil guidelines for some PAHs and PCBs in agricultural, residential, and commercial/industrial property. The organic soil results in Table 2 are compared with the ***proposed interim residential guidelines***, where applicable.

Some PAH compounds were detected at all four sample sites. The concentrations at Sites 4, 5, and 6 were marginally above detection limit and similar to concentrations detected in urban soil from other areas where no PAH source is suspected (i.e., these reflect urban background levels). The soil PAH concentrations at Site 1, directly adjacent to the north side of the ENP building, were consistently higher than the other three sites. However, even though soil PAH concentrations were marginally higher at Site 1, the proposed interim CCME guidelines for residential soil were not exceeded. Although some soil PAH concentrations were elevated by the ENP building, there was no contamination gradient relative to distance or direction from the source.

PCBs were detected at two of the four sample sites; Site 4 - 130 ppb, Site 6 - 35 ppb. Previous Phytotoxicology surveys have determined that PCBs are virtually ubiquitous in urban soil with background concentrations ranging up to 350 ppb. PCBs were not detected (below analytical detection limit of about 20 ppb) at Site 1, where some PAH concentrations were elevated.

Conclusions

This preliminary investigation examined soil inorganic and organic contaminants from sensitive receptor areas (playgrounds, residential lawns, community green areas) in the immediate vicinity of ENP. There was no soil contamination gradient even though most PAH compounds and Sb concentrations were highest at the site adjacent to the plating building. Interim guidelines for PAHs in residential soil were not exceeded at any of the sample sites. There was no evidence that soil had been contaminated on residential and municipal properties closest to the source. This is encouraging considering the length of time (about 70 years) that this facility has been operating on this site. Many of the inorganic elements and organic compounds for which testing was conducted are quite persistent in the soil, and therefore they would have had sufficient time to accumulate in surface soil. The sample sites were very close to Etched Name Plate, yet no off-property contamination was found. The concentrations detected on-property were only marginally elevated and of little environmental consequence. Results of this investigation indicated that emissions from ENP have not contaminated soil on adjacent residential and municipal properties.

Table 1
Concentrations[1] of Inorganic Elements in Surface Soil[2] in the Vicinity of Etched Name Plate - July 24, 1991.

Element	Site[3] 1 1m N	Site 2 15m N	Site 3 50m NW	Site 4 75m W	Site 5 100m NE	Site 6 120m SE	Site 7 200m NE	ULN
Cu	13	23	25	70	26	24	28	100
Ni	10	8	11	14	11	9	12	60
Pb	112	41	115	375	155	115	82	500
Zn	60	56	120	195	86	125	83	500
Fe	13000	8600	14000	19000	14500	13000	18000	35000
Mn	240	205	305	400	350	285	465	700
Al	3600	3700	8900	10000	9450	8100	11000	NE
As	2.6	4.9	4.1	7.4	3.0	5.3	3.5	20
Cd	0.44	0.19t	0.56	1.08	0.52	0.63	0.52	4
Co	2.6	2.0	3.9	4.9	4.6	3.5	5.4	25
Cr	11	12	21	21	19	30	20	50
Mo	0.4t	0.6t	0.3t	0.9	<0.2	<0.2	0.5t	3
Na	165	165	170	145	160	120	155	NE
Sb	3.72	0.98t	0.61t	1.30	0.42t	0.64t	1.30	8
Se	<0.20	0.23t	0.50t	1.10	0.48t	0.77t	0.62t	2
Sr	135	135	47	38	37	27	30	NE
V	29	20	29	34	29	25	33	70

1 - parts per million, air-dried weight, mean of duplicate analysis.
2 - sampling depth 0 to 5 cm.
3 - sites described in text, distances and directions from Etched Name Plate are approximate.
ULN - Phytotoxicology Upper Limit of Normal guideline for urban surface soil, see Appendix 1.
NE - ULN not established.
t - a measurable trace concentration, interpret with caution.
< - no measurable response, less than analytical detection limit.

Cu - copper
Ni - nickel
Pb - lead
Zn - zinc
Fe - iron
Mn - manganese
Al - aluminum
As - arsenic
Cd - cadmium
Co - cobalt
Cr - chromium
Mo - molybdenum
Na - sodium
Sb - antimony
Sr - strontium
V - vanadium

Table 2
Concentrations[1] of Selected Organic Compounds in Surface Soil[2] in the Vicinity of Etched Name Plate - July 24, 1991.

Compound	Site[3] 1 1m N	Site 4 75m W	Site 5 100m NE	Site 6 120m SE	Guideline[4]
Dibenzo(a,h)anthracene	30	5[U]	4	6	1,000
Benzo(g,h,i)perylene	81	17	8	13	NE
Naphthalene	3	2	1	1[U]	5,000
Acenapthylene	13	4	1	4	NE
Acenaphthene	4	2	2[U]	8	NE
Fluorene	6	2	2	1[U]	NE
Phenanthrene	89	31	20	21	5,000
Anthracene	36	9	5	6	NE
Fluoranthene	153	58	30	38	NE
Pyrene	135	51	25	2	10,000
Benzo(a)anthracene	103	29	14	16	1,000
Chrysene	91	33	15	20	NE
Benzo(k)fluoranthene	8	6	2	4	1,000
Benzo(b)fluoranthene	240	81	37	48	1,000
Benzo(a)pyrene	89	28[U]	15	20	1,000
Indeno(1,2,3-cd)pyrene	7	16	7	11	1,000
Polychlorinated biphenyl (PCB)	<20	130[Rt]	<20	35[Rt]	5,000

1 - parts per billion, air-dried weight, single samples.
2 - sampling depth 0 to 5 cm.
3 - sites described in text, distances and directions from Etched Name Plate are approximate.
4 - guidelines are the residential interim CCME Canadian Environmental Quality Criteria for Contaminated Sites (Report CCME EPC-CS34, August 1991).
NE - guideline not established.
U - unreliable data, analytical instrument interference.
R - PCB resembles a mixture of Arochlor 1254 and 1260.
< - no measurable response, less than analytical detection limit.
t - a measurable trace amount, interpret with caution.

Appendix

Derivation and Significance of the MOE Phytotoxicology "Upper Limits of Normal" Contaminant Guidelines.

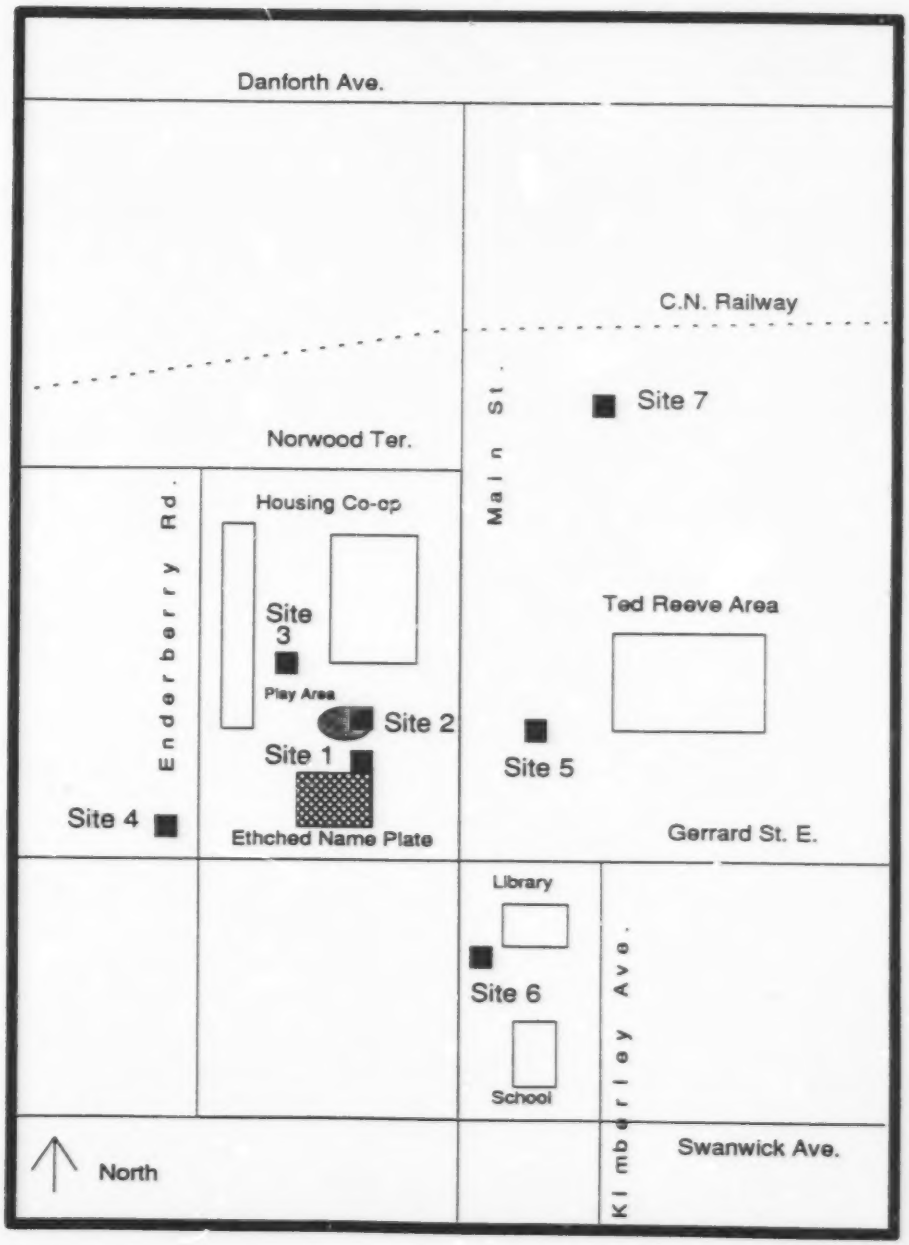
The MOE Upper Limits of Normal (ULN) contaminant guidelines represent the expected maximum concentration in surface soil, foliage (trees and shrubs), grass, moss bags, and snow from areas in Ontario not exposed to the influence of a point source of pollution. Urban ULN guidelines are based on samples collected from developed urban centres, whereas rural ULN guidelines were developed from non-urbanized areas. Samples were collected by Phytotoxicology staff using standard sampling procedures (ref: Ontario Ministry of the Environment 1983, *Phytotoxicology Field Investigation Manual*). Chemical analyses were conducted by the MOE Laboratory Services Branch.

The ULN is the arithmetic mean, plus three standard deviations of the mean, of the suitable background data. This represents 99% of the sample population. This means that for every 100 samples which have not been exposed to a point source of pollution, 99 will fall within the ULN.

The ULNs do not represent maximum desirable or allowable limits. Rather, they are an indication that concentrations that exceed the ULN may be the result of contamination from a pollution source. Concentrations that exceed the ULNs are not necessarily toxic to plants, animals, or people. Concentrations that are below the ULNs are not known to be toxic.

ULNs are not available for all elements. This is because some elements have a very large range in the natural environment and the ULN, calculated as the mean plus three standard deviations, would be unrealistically high. Also, for some elements, insufficient background data is available to confidently calculate ULNs. The MOE Phytotoxicology ULNs are constantly being reviewed as the background environmental data base is expanded. This will result in more ULNs being established and may amend existing ULNs.

Approximate Locations of the Soil Sample Sites,
July 24, 1991.



Sketch Map Not To Scale.